

Ephemeris for Physical Observations

| Greenwich Noon. | Angle of Position of M's Axis. | Latitude of Earth Sun above M's Equator. | Annual Parallax. Λ-L. | L-O. | Longitude of M's Central Meridian. | | Corr. for Phase. |
|--------------------|--------------------------------------|--|-----------------------------|----------|---------------------------------------|------------------|------------------------|
| | | | | | (877° 90') I. | 870° 27') II. | |
| 1889. | | | | | | | |
| Feb. 26 | 357° 492 | -2° 245 | -2° 404 | -9° 777 | 138° 269 | 240° 18 | +0° 42 |
| Mar. 3 | 357° 147 | 2° 228 | 2° 391 | 10° 116 | 139° 012 | 309° 31 | '45 |
| 8 | 356° 827 | 2° 211 | 2° 377 | 10° 401 | 139° 702 | 18° 51 | '47 |
| 13 | 356° 534 | 2° 195 | 2° 363 | 10° 630 | 140° 336 | 87° 77 | '49 |
| 18 | 356° 268 | 2° 180 | 2° 349 | 10° 800 | 140° 910 | 157° 10 | '51 |
| 23 | 356° 031 | 2° 166 | 2° 335 | 10° 907 | 141° 422 | 226° 50 | '52 |
| 28 | 355° 825 | 2° 153 | 2° 321 | 10° 948 | 141° 869 | 295° 96 | '52 |
| Apr. 2 | 355° 652 | -2° 141 | -2° 307 | -10° 919 | 142° 246 | 5° 49 | +0° 52 |
| 7 | 355° 512 | 2° 130 | 2° 293 | 10° 818 | 142° 551 | 75° 09 | '51 |
| 12 | 355° 406 | 2° 120 | 2° 278 | 10° 643 | 142° 782 | 144° 76 | '49 |
| 17 | 355° 334 | 2° 112 | 2° 263 | 10° 391 | 142° 937 | 214° 49 | '47 |
| 22 | 355° 298 | 2° 105 | 2° 249 | 10° 061 | 143° 014 | 284° 29 | '44 |
| 27 | 355° 299 | 2° 099 | 2° 234 | 9° 653 | 143° 013 | 354° 16 | '41 |
| May 2 | 355° 335 | -2° 094 | -2° 219 | -9° 165 | 142° 933 | 64° 09 | +0° 37 |
| 7 | 355° 407 | 2° 091 | 2° 204 | 8° 600 | 142° 775 | 134° 08 | '32 |
| 12 | 355° 514 | 2° 088 | 2° 188 | 7° 959 | 142° 541 | 204° 12 | '28 |
| 17 | 355° 654 | 2° 086 | 2° 173 | 7° 245 | 142° 235 | 274° 21 | '23 |
| 22 | 355° 826 | 2° 085 | 2° 157 | 6° 462 | 141° 861 | 344° 34 | '18 |
| 27 | 356° 028 | 2° 085 | 2° 142 | 5° 615 | 141° 423 | 54° 50 | '14 |
| June 1 | 356° 256 | -2° 085 | -2° 126 | -4° 711 | 140° 928 | 124° 69 | +0° 10 |
| 6 | 356° 507 | 2° 085 | 2° 110 | 3° 758 | 140° 384 | 194° 90 | '06 |
| 11 | 356° 777 | 2° 085 | 2° 094 | 2° 765 | 139° 801 | 265° 11 | '03 |
| 16 | 357° 061 | 2° 086 | 2° 078 | 1° 743 | 139° 188 | 335° 32 | '01 |
| 21 | 357° 354 | 2° 086 | 2° 062 | -0° 701 | 138° 556 | 45° 50 | |
| 26 | 357° 652 | 2° 085 | 2° 045 | +0° 350 | 137° 915 | 115° 65 | |
| July 1 | 357° 949 | -2° 084 | -2° 029 | 1° 398 | 137° 278 | 185° 76 | -0° 01 |
| 6 | 358° 239 | 2° 082 | 2° 012 | 2° 432 | 136° 655 | 255° 83 | '03 |
| 11 | 358° 518 | 2° 079 | 1° 996 | 3° 440 | 136° 058 | 325° 84 | '05 |
| 16 | 358° 780 | 2° 076 | 1° 979 | 4° 413 | 135° 496 | 35° 77 | '08 |
| 21 | 359° 021 | 2° 071 | 1° 962 | 5° 342 | 134° 979 | 105° 62 | '12 |
| 26 | 359° 238 | 2° 066 | 1° 945 | 6° 218 | 134° 515 | 175° 39 | '17 |
| 31 | 359° 427 | 2° 060 | 1° 928 | 7° 033 | 134° 112 | 245° 07 | '22 |
| Aug. 5 | 359° 584 | -2° 053 | -1° 911 | +7° 782 | 133° 775 | 314° 65 | -0° 26 |
| 10 | 359° 708 | 2° 045 | 1° 893 | 8° 460 | 133° 510 | 24° 13 | '31 |

Dec. 1888.

Physical Observations of Jupiter.

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of Jupiter, 1889. By A. Marth.

| Greenwich Noon. | Diameter Equat. Polar | | Difference of limbs in A.R. in Decl. | | Defect of illumination. Equat. in A.R. preceding limb. | | <i>d</i> | <i>w</i> |
|--------------------|----------------------------|--------|---|----------|--|-------|--------------|--------------|
| 1889 | | | ^s | | ^s | | ^o | ^o |
| Feb. 26 | 34''79 | 32''58 | 2'521 | 32''59 | 0'25 | 0'018 | 9'77 | 271'21 |
| Mar. 3 | 35'26 | 33'02 | 2'555 | 33'03 | '27 | '020 | 10'11 | '20 |
| 8 | 35'75 | 33'48 | 2'590 | 33'49 | '29 | '021 | 10'39 | '20 |
| 13 | 36'27 | 33'97 | 2'627 | 33'98 | '31 | '022 | 10'62 | '19 |
| 18 | 36'82 | 34'48 | 2'666 | 34'49 | '33 | '024 | 10'79 | '19 |
| 23 | 37'39 | 35'00 | 2'706 | 35'02 | '34 | '024 | 10'90 | '18 |
| 28 | 37'97 | 35'55 | 2'748 | 35'57 | '34 | '025 | 10'94 | '17 |
| Apr. 2 | 38'57 | 36'12 | 2'792 | 36'14 | 0'35 | 0'025 | 10'91 | 271'16 |
| 7 | 39'19 | 36'70 | 2'836 | 36'71 | '35 | '025 | 10'81 | '14 |
| 12 | 39'82 | 37'29 | 2'881 | 37'30 | '34 | '025 | 10'63 | '12 |
| 17 | 40'46 | 37'88 | 2'927 | 37'90 | '33 | '024 | 10'38 | '10 |
| 22 | 41'10 | 38'48 | 2'973 | 38'50 | '31 | '023 | 10'05 | '08 |
| 27 | 41'73 | 39'07 | 3'019 | 39'10 | '29 | '021 | 9'65 | '05 |
| May 2 | 42'35 | 39'65 | 3'064 | 39'68 | 0'27 | 0'019 | 9'16 | 271'02 |
| 7 | 42'96 | 40'22 | 3'109 | 40'24 | '24 | '017 | 8'59 | 270'98 |
| 12 | 43'54 | 40'77 | 3'152 | 40'79 | '21 | '015 | 7'95 | 270'93 |
| 17 | 44'09 | 41'28 | 3'192 | 41'30 | '18 | '013 | 7'24 | 270'88 |
| 22 | 44'60 | 41'76 | 3'230 | 41'78 | '14 | '011 | 6'46 | 270'82 |
| 27 | 45'06 | 42'19 | 3'264 | 42'21 | '11 | '008 | 5'61 | 270'73 |
| June 1 | 45'46 | 42'57 | 3'294 | 42'59 | 0'08 | 0'006 | 4'71 | 270'62 |
| 6 | 45'80 | 42'89 | 3'319 | 42'90 | '05 | '004 | 3'75 | 270'49 |
| 11 | 46'07 | 43'14 | 3'340 | 43'15 | '03 | '002 | 2'76 | 270'26 |
| 16 | 46'27 | 43'32 | 3'355 | 43'33 | '01 | '001 | 1'74 | 269'7 |
| 21 | 46'39 | 43'43 | 3'365 | 43'44 | on following | | 0'70 | 268'0 |
| 26 | 46'42 | 43'47 | 3'368 | 43'47 | limb | | 0'35 | 97'0 |
| July 1 | 46'37 | 43'43 | 3'365 | 43'43 | | | 1'40 | 92'4 |
| 6 | 46'25 | 43'31 | 3'357 | does | 0'02 | 0'002 | 2'43 | 91'71 |
| 11 | 46'05 | 43'12 | 3'343 | not | '04 | '003 | 3'44 | 91'41 |
| 16 | 45'77 | 42'86 | 3'323 | differ | '07 | '005 | 4'41 | 91'26 |
| 21 | 45'43 | 42'54 | 3'298 | from | '10 | '007 | 5'34 | 91'15 |
| 26 | 45'02 | 42'16 | 3'269 | polar | '13 | '010 | 6'21 | 91'07 |
| 31 | 44'56 | 41'73 | 3'236 | diameter | '17 | '012 | 7'03 | 91'01 |
| Aug. 5 | 44'06 | 41'26 | 3'200 | | 0'20 | 0'015 | 7'78 | 90'97 |
| 10 | 43'52 | 40'75 | 3'161 | | '24 | '017 | 8'46 | '94 |

| Greenwich Noon. | Angle of Position of \mathcal{U} 's Axis. | Latitude of Earth Sun above \mathcal{U} 's Equator. | | Annual Parallax. | Longitude of \mathcal{U} 's Central Meridian. (877°0'30) (870°0'27) | | | | Corr. for Phase. |
|-----------------|---|---|--------|------------------|---|--------|--------|-------|------------------|
| | | | | $\Lambda - L.$ | $L - O.$ | I. | II. | | |
| 1889. | | | | | | | | | |
| Aug. 15 | 359°797 | 2°036 | 1°876 | 9°064 | 133°320 | 93°52 | 233°62 | °36 | |
| 20 | 359°850 | 2°026 | 1°858 | 9°591 | 133°207 | 162°81 | 264°77 | °40 | |
| 25 | 359°866 | 2°015 | 1°840 | 10°040 | 133°171 | 232°01 | 295°82 | °44 | |
| 30 | 359°845 | 2°004 | 1°823 | 10°410 | 133°215 | 301°11 | 326°77 | °47 | |
| Sept. 4 | 359°788 | -1°992 | -1°805 | +10°702 | 133°338 | 10°12 | 357°64 | -0°50 | |
| 9 | 359°694 | 1°979 | 1°787 | 10°917 | 133°538 | 79°05 | 28°42 | °52 | |
| 14 | 359°565 | 1°965 | 1°769 | 11°057 | 133°813 | 147°89 | 59°11 | °53 | |
| 19 | 359°402 | 1°950 | 1°750 | 11°123 | 134°161 | 216°66 | 89°73 | °54 | |
| 24 | 359°206 | 1°935 | 1°732 | 11°119 | 134°581 | 285°35 | 120°28 | °54 | |
| 29 | 358°977 | 1°919 | 1°714 | 11°047 | 135°069 | 353°97 | 150°76 | °53 | |
| Oct. 4 | 358°718 | -1°902 | -1°695 | +10°910 | 135°622 | 62°54 | 181°17 | -0°52 | |
| 9 | 358°430 | 1°883 | 1°676 | 10°712 | 136°237 | 131°05 | 211°53 | °50 | |
| 14 | 358°116 | 1°864 | 1°658 | 10°455 | 136°909 | 199°50 | 241°84 | °48 | |
| 19 | 357°776 | 1°844 | 1°639 | 10°144 | 137°636 | 267°91 | 272°10 | °45 | |
| 24 | 357°412 | -1°823 | -1°620 | +9°782 | 138°416 | 336°29 | 302°33 | 0°42 | |

The angle $\Lambda - L$ is the difference of the Jovicentric longitudes of the Sun and Earth, reckoned in the plane of *Jupiter's* equator; $L - O + 180^\circ$ the Jovicentric longitude of the Earth reckoned from O , the point of the vernal equinox of *Jupiter's* northern hemisphere or the point of the ascending node of the planet's orbit on its equator.

Two values of the "longitude of \mathcal{U} 's central meridian" are given for each date: the first, computed with the daily rate of rotation $877^\circ 90$, being intended for comparing the observations of white spots in the neighbourhood of the planet's equator; the second, computed with the rate $870^\circ 27$, for the observations of the remnant of the great reddish spot in the planet's southern hemisphere. This latter rate is the same as that adopted in the ephemerides for the two preceding oppositions, but the zero-meridian has been put back 10° or the longitudes in the present ephemeris have been increased 10° , in order that the zero-meridian may precede the middle of the spot, at least in case the rate of the spot's motion does not become sensibly accelerated. The daily rate $877^\circ 90$ of system I is approximately that of the motion of two bright spots, observed during the past apparition of *Jupiter* at Brighton by Mr. A. S. Williams, who has been good enough to communicate his observations to me, the only ones which have yet come to my knowledge. His few observations of an equatorial spot procured in 1887 seem to belong to one of these spots. But the irregularity and uncertainty of the motion, and the want of sufficient observations between 1885 and 1887 render it, for the present at least, not feasible to establish the

| Greenwich Noon. | Diameter | | Difference of limbs | | Defect of illumination. | | <i>d</i> | <i>w</i> |
|--------------------|----------|--------|---------------------|----------|-------------------------|----------------------------|----------|----------|
| | Equat. | Polar | in A.R. | in Decl. | Equat. | in A.R. preceding limb. | | |
| 1889 | | | | | | | | |
| Aug. 15 | 42° 95 | 40° 22 | 3° 120 | | 27 | 0° 19 | 9° 06 | 0° 91 |
| 20 | 42° 36 | 39° 66 | 3° 077 | | 30 | 0° 21 | 9° 59 | 0° 89 |
| 25 | 41° 75 | 39° 09 | 3° 033 | | 32 | 0° 23 | 10° 03 | 0° 88 |
| 30 | 41° 13 | 38° 52 | 2° 989 | | 34 | 0° 25 | 10° 41 | 0° 88 |
| Sept. 4 | 40° 52 | 37° 94 | 2° 944 | | 35 | 0° 26 | 10° 70 | 0° 88 |
| 9 | 39° 91 | 37° 37 | 2° 900 | | 36 | 0° 26 | 10° 91 | 0° 88 |
| 14 | 39° 30 | 36° 80 | 2° 856 | | 36 | 0° 26 | 11° 05 | 0° 89 |
| 19 | 38° 71 | 36° 24 | 2° 813 | | 36 | 0° 26 | 11° 12 | 0° 90 |
| 24 | 38° 13 | 35° 70 | 2° 772 | | 36 | 0° 26 | 11° 11 | 0° 92 |
| 29 | 37° 57 | 35° 18 | 2° 731 | | 35 | 0° 25 | 11° 04 | 0° 95 |
| Oct. 4 | 37° 03 | 34° 67 | 2° 692 | | 33 | 0° 24 | 10° 91 | 0° 98 |
| 9 | 36° 51 | 34° 19 | 2° 655 | | 32 | 0° 23 | 10° 71 | 0° 00 |
| 14 | 36° 02 | 33° 73 | 2° 619 | | 30 | 0° 22 | 10° 45 | 0° 03 |
| 19 | 35° 55 | 33° 29 | 2° 585 | | 28 | 0° 20 | 10° 14 | 0° 07 |
| 24 | 35° 11 | 32° 88 | 2° 552 | | 26 | 0° 19 | 9° 78 | 0° 11 |

connection between these spots and the chief white spot, observed from 1880 to 1886, especially assiduously by Mr. Denning at Bristol.—The differences of successive values of the longitudes of \mathcal{A} 's central meridian amount, for the interval of five days, to twelve rotations in addition to the differences directly deduced, so that, for instance, the differences of the first two values are $4389^{\circ}.13$ and $4350^{\circ}.98$. The addition of the "correction for phase" to the longitudes of the central meridian gives the longitudes of the meridian which bisects the illuminated disc. A list of Greenwich times when these latter longitudes are 0° is given further on.

The diameters of the disc, &c., depend on the same assumed values as in the ephemerides for preceding years. The formulæ employed may be found in vol. xlv. p. 508.

The inclinations γ and the ascending nodes Γ of the orbits of the four satellites of *Jupiter* in reference to the assumed plane of the planet's equator are the following, the longitudes of the nodes being reckoned from O, the point of the ascending node of *Jupiter's* orbit on the equator:

| | Sat. I. | | Sat. II. | | Sat. III. | | Sat. IV. | |
|---------|------------|------------|------------|------------|------------|------------|------------|------------|
| | γ_1 | Γ_1 | γ_2 | Γ_2 | γ_3 | Γ_3 | γ_4 | Γ_4 |
| 1889. | | | | | | | | |
| Feb. 26 | 0° 0106 | 271° 0 | 0° 4923 | 267° 38 | 0° 1342 | 245° 93 | 0° 3130 | 331° 47 |
| Apr. 27 | 0° 0105 | 268° 7 | 0° 4923 | 265° 45 | 0° 1336 | 245° 51 | 0° 3122 | 331° 44 |
| June 26 | 0° 0103 | 266° 3 | 0° 4923 | 263° 52 | 0° 1331 | 245° 10 | 0° 3114 | 331° 39 |
| Aug. 25 | 0° 0102 | 264° 0 | 0° 4923 | 261° 59 | 0° 1327 | 244° 70 | 0° 3107 | 331° 32 |
| Oct. 24 | 0° 0101 | 261° 8 | 0° 4924 | 259° 66 | 0° 1323 | 244° 31 | 0° 3100 | 331° 23 |

The following is a list of Greenwich mean times, when the zero meridian in the assumed two systems of longitudes will pass the middle of the illuminated disc:

| | | I. | | II. | | | | I. | | II. | |
|------------------|----|-----------|------|-----------|------|------------------|----|-----------|------|-----------|------|
| | | (877°·90) | | (870°·27) | | | | (877°·90) | | (870°·27) | |
| ^{1889.} | | h | m | h | m | ^{1889.} | | h | m | h | m |
| Feb. | 26 | 13 | 6·4 | 13 | 17·9 | Apr. | 1 | 13 | 59·6 | 11 | 25·2 |
| | 27 | 18 | 38·1 | 19 | 5·0 | | 2 | 19 | 31·1 | 17 | 12·2 |
| | 28 | 14 | 19·1 | 14 | 56·5 | | 3 | 15 | 12·1 | 13 | 3·5 |
| Mar. | 1 | 19 | 50·8 | 20 | 43·7 | | 4 | 10 | 53·1 | 18 | 50·5 |
| | 2 | 15 | 31·9 | 16 | 35·1 | | 5 | 16 | 24·5 | 14 | 41·8 |
| | 3 | 11 | 12·9 | 12 | 26·5 | | 6 | 12 | 5·5 | 10 | 33·2 |
| | 4 | 16 | 44·6 | 18 | 13·7 | | 7 | 17 | 37·0 | 16 | 20·2 |
| | 5 | 12 | 25·6 | 14 | 5·1 | | 8 | 13 | 17·9 | 12 | 11·5 |
| | 6 | 17 | 57·3 | 19 | 52·3 | | 9 | 18 | 49·4 | 17 | 58·5 |
| | 7 | 13 | 38·3 | 15 | 43·6 | | 10 | 14 | 30·3 | 13 | 49·8 |
| | 8 | 19 | 9·9 | 11 | 35·1 | | 11 | 10 | 11·3 | 9 | 41·1 |
| | 9 | 14 | 51·0 | 17 | 22·3 | | 12 | 15 | 42·7 | 15 | 28·0 |
| | 10 | 10 | 32·1 | 13 | 13·7 | | 13 | 11 | 23·7 | 11 | 19·3 |
| | 11 | 16 | 3·6 | 19 | 0·8 | | 14 | 16 | 55·1 | 17 | 6·3 |
| | 12 | 11 | 44·7 | 14 | 52·2 | | 15 | 12 | 36·0 | 12 | 57·6 |
| | 13 | 17 | 16·3 | 10 | 43·6 | | 16 | 8 | 17·0 | 8 | 48·9 |
| | 14 | 12 | 57·3 | 16 | 30·7 | | | 18 | 7·4 | 18 | 44·5 |
| | 15 | 18 | 28·9 | 12 | 22·1 | | 17 | 13 | 48·4 | 14 | 35·8 |
| | 16 | 14 | 9·9 | 18 | 9·2 | | 18 | 9 | 29·3 | 10 | 27·1 |
| | 17 | 19 | 41·5 | 14 | 0·6 | | | 19 | 19·8 | 20 | 22·7 |
| | 18 | 15 | 22·5 | 19 | 47·7 | | 19 | 15 | 0·7 | 16 | 14·0 |
| | 19 | 11 | 3·5 | 15 | 39·1 | | 20 | 10 | 41·6 | 12 | 5·3 |
| | 20 | 16 | 35·1 | 11 | 30·4 | | 21 | 16 | 13·0 | 17 | 52·2 |
| | 21 | 12 | 16·1 | 17 | 17·5 | | 22 | 11 | 53·9 | 13 | 43·4 |
| | 22 | 17 | 47·6 | 13 | 8·9 | | 23 | 17 | 25·3 | 9 | 34·7 |
| | 23 | 13 | 28·6 | 18 | 55·9 | | 24 | 13 | 6·2 | 15 | 21·6 |
| | 24 | 19 | 0·1 | 14 | 47·3 | | 25 | 8 | 47·1 | 11 | 12·9 |
| | 25 | 14 | 41·2 | 10 | 38·7 | | 26 | 14 | 18·5 | 16 | 59·8 |
| | 26 | 10 | 22·2 | 16 | 25·7 | | 27 | 9 | 59·4 | 12 | 51·0 |
| | 27 | 15 | 53·7 | 12 | 17·1 | | 28 | 15 | 30·7 | 8 | 42·3 |
| | 28 | 11 | 34·7 | 18 | 4·1 | | 29 | 11 | 11·6 | 14 | 29·2 |
| | 29 | 17 | 6·2 | 13 | 55·5 | | 30 | 16 | 42·9 | 10 | 20·4 |
| | 30 | 12 | 47·2 | 19 | 42·5 | May | 1 | 12 | 23·8 | 16 | 7·3 |
| | 31 | 18 | 18·7 | 15 | 33·8 | | 2 | 8 | 4·7 | 11 | 58·5 |

Dec. 1888.

Physical Observations of Jupiter.

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| | | I. | | II. | | | | I. | | II. | | |
|-------|----|----------|------|----------|------|-------|---|------------------|------|----------|--|------|
| | | (877°90) | | (870°27) | | | | (877°90) | | (870°27) | | |
| 1889. | | h | m | h | m | 1889. | | h | m | h | m | |
| May | 3 | 13 | 36.1 | 17 | 45.4 | June | 3 | 7 | 37.8 | 8 | 19.7 | |
| | 4 | 9 | 16.9 | 13 | 36.6 | | | 17 | 28.2 | 18 | 15.3 | |
| | 5 | 14 | 48.3 | 9 | 27.9 | 4 | | 13 | 9.0 | 14 | 6.5 | |
| | 6 | 10 | 29.1 | 15 | 14.7 | 5 | | 8 | 49.8 | 9 | 57.7 | |
| | 7 | 16 | 0.4 | 11 | 5.9 | 6 | | 14 | 21.1 | 15 | 44.4 | |
| | 8 | 11 | 41.3 | 16 | 52.8 | 7 | | 10 | 1.9 | 11 | 35.6 | |
| | 9 | 17 | 12.6 | 12 | 44.0 | 8 | | 15 | 33.1 | 17 | 22.3 | |
| | 10 | 12 | 53.5 | 8 | 35.2 | 9 | | 11 | 13.9 | 13 | 13.5 | |
| | 11 | 8 | 34.3 | 14 | 22.0 | 10 | | 16 | 45.2 | 9 | 4.7 | |
| | 12 | 14 | 5.6 | 10 | 13.2 | 11 | | 12 | 26.0 | 14 | 51.4 | |
| | 13 | 9 | 46.5 | 16 | 0.1 | 12 | | 8 | 6.8 | 10 | 42.6 | |
| | 14 | 15 | 17.8 | 11 | 51.3 | 13 | | 13 | 38.0 | 16 | 29.3 | |
| | 15 | 10 | 58.6 | 17 | 38.1 | 14 | | 9 | 18.8 | 12 | 20.5 | |
| | 16 | 16 | 29.9 | 13 | 29.3 | 15 | | 14 | 50.0 | 8 | 11.7 | |
| | 17 | 12 | 10.7 | 9 | 20.5 | 16 | | 10 | 30.9 | 13 | 58.4 | |
| | 18 | 17 | 42.0 | 15 | 7.3 | 17 | | 16 | 2.1 | 9 | 49.6 | |
| | 19 | 13 | 22.9 | 10 | 58.5 | 18 | | 11 | 42.9 | 15 | 36.4 | |
| | 20 | 9 | 3.7 | 16 | 45.3 | 19 | | 7 | 23.7 | 11 | 27.5 | |
| | 21 | 14 | 35.0 | 12 | 36.5 | 20 | | 12 | 55.0 | 7 | 18.7 | |
| | 22 | 10 | 15.8 | 8 | 27.6 | 21 | | 8 | 35.8 | 13 | 5.5 | |
| | 23 | 15 | 47.1 | 14 | 14.4 | 22 | | 14 | 7.0 | 8 | 56.6 | |
| | 24 | 11 | 27.9 | 10 | 5.6 | 23 | | 9 | 47.8 | 14 | 43.4 | |
| | 25 | 16 | 59.1 | 15 | 52.4 | 24 | Transit of Earth and Moon across Sun's disc. <i>Vide M.</i> <i>Not.</i> vol. xlv. p. 163. | | | | | |
| | 26 | 12 | 40.0 | 11 | 43.6 | | | 15 | 19.1 | 10 | 34.6 | |
| | 27 | 8 | 20.8 | 7 | 34.7 | | | 25 | 10 | 59.9 | 16 | 21.3 |
| | | 18 | 11.2 | 17 | 30.3 | | | 26 | 16 | 31.2 | 12 | 12.5 |
| | 28 | 13 | 52.0 | 13 | 21.5 | | | 27 | 12 | 12.0 | 8 | 3.7 |
| | 29 | 9 | 32.9 | 9 | 12.7 | | | 28 | 7 | 52.8 | 13 | 50.5 |
| | | 19 | 23.3 | 19 | 8.3 | | | 29 | 9 | 22 | Middle of second tabular eclipse of | |
| | 30 | 15 | 4.1 | 14 | 59.5 | | | | | | | |
| | 31 | 10 | 44.9 | 10 | 50.6 | | | <i>Sat. IV.*</i> | | | | |
| June | 1 | 6 | 25.7 | 6 | 41.8 | | | 13 | 24.1 | 9 | 41.6 | |
| | | 16 | 16.2 | 16 | 37.4 | | | 30 | 9 | 4.9 | 15 | 28.4 |
| | 2 | 11 | 57.0 | 12 | 28.6 | | | | | | | |

* There will be probably no real eclipse, but the satellite will remain visible as a speck of light skirting the margin of the total shadow. *Vide Monthly Notices*, vol. xlv. p. 243.

| | | I. | | II. | | | | I. | | II. | |
|-------|----|--------------------------------|------|-----------|------|-------|----|----------------------------|------|-----------|------|
| | | (877°·90) | | (870°·27) | | | | (877°·90) | | (870°·27) | |
| 1889. | | h | m | h | m | 1889. | | h | m | h | m |
| July | 1 | 14 | 36·2 | 11 | 19·6 | July | 29 | 11 | 46·9 | 14 | 22·4 |
| | 2 | 10 | 17·0 | 7 | 10·8 | | 30 | 7 | 27·9 | 10 | 13·7 |
| | 3 | 15 | 48·3 | 12 | 57·6 | | 31 | 12 | 58·4 | 6 | 5·0 |
| | 4 | 11 | 29·2 | 8 | 48·9 | Aug. | 1 | 8 | 40·3 | 11 | 52·0 |
| | 5 | 7 | 10·0 | 14 | 35·7 | | | 18 | 30·8 | 21 | 47·7 |
| | 6 | 12 | 41·3 | 10 | 26·9 | | | 21 | 29 | Middle of | |
| | 7 | 8 | 22·2 | 6 | 18·1 | | | second eclipse of Sat. IV. | | | |
| | | 18 | 12·6 | 16 | 13·7 | | 2 | 14 | 11·8 | 7 | 43·4 |
| | 8 | 13 | 53·5 | 12 | 4·9 | | 3 | 9 | 52·8 | 13 | 30·4 |
| | 9 | 9 | 34·4 | 7 | 56·2 | | 4 | 5 | 33·8 | 9 | 21·7 |
| | 10 | 15 | 5·7 | 13 | 43·0 | | | 15 | 24·3 | 19 | 17·4 |
| | 11 | 10 | 46·5 | 9 | 34·2 | | 5 | 11 | 5·3 | 15 | 8·8 |
| | 12 | 6 | 27·4 | 5 | 25·5 | | 6 | 6 | 46·3 | 11 | 0·1 |
| | | 16 | 17·9 | 15 | 21·1 | | 7 | 12 | 17·8 | 6 | 51·5 |
| | 13 | 11 | 58·8 | 11 | 12·3 | | 8 | 7 | 58·9 | 12 | 38·6 |
| | 14 | 7 | 39·7 | 7 | 3·6 | | 9 | 13 | 30·4 | 8 | 29·9 |
| | | 17 | 30·1 | 16 | 59·2 | | 10 | 9 | 11·4 | 4 | 21·3 |
| | 15 | 13 | 11·0 | 12 | 50·4 | | | 19 | 1·9 | 14 | 17·0 |
| | 16 | 3 | 25 | Middle of | | | 11 | 4 | 52·5 | 10 | 8·4 |
| | | first real eclipse of Sat. IV. | | | | | | 14 | 43·0 | 20 | 4·1 |
| | | Duration uncertain. | | | | | 12 | 10 | 24·0 | 5 | 59·8 |
| | | 8 | 51·9 | 8 | 41·7 | | | 20 | 14·5 | 15 | 55·5 |
| | 17 | 14 | 23·3 | 14 | 28·6 | | 13 | 6 | 5·1 | 11 | 46·9 |
| | 18 | 10 | 4·2 | 10 | 19·9 | | 14 | 11 | 36·6 | 7 | 38·3 |
| | 19 | 5 | 45·1 | 6 | 11·1 | | 15 | 7 | 17·7 | 13 | 25·4 |
| | | 15 | 35·6 | 16 | 6·8 | | 16 | 12 | 49·3 | 9 | 16·8 |
| | 20 | 11 | 16·5 | 11 | 58·0 | | 17 | 8 | 30·4 | 15 | 4·0 |
| | 21 | 6 | 57·4 | 7 | 49·3 | | 18 | 14 | 2·0 | 10 | 55·4 |
| | | 16 | 47·9 | 17 | 45·0 | | | 15 | 34 | Middle of | |
| | 22 | 12 | 28·8 | 13 | 36·3 | | | third eclipse of Sat. IV. | | | |
| | 23 | 8 | 9·8 | 9 | 27·5 | | 19 | 9 | 43·0 | 6 | 46·8 |
| | 24 | 13 | 41·2 | 15 | 14·5 | | 20 | 5 | 24·1 | 12 | 34·0 |
| | 25 | 9 | 22·1 | 11 | 5·8 | | 21 | 10 | 55·8 | 8 | 25·4 |
| | 26 | 5 | 3·1 | 6 | 57·1 | | 22 | 6 | 36·8 | 14 | 12·6 |
| | | 14 | 53·5 | 16 | 52·8 | | 23 | 12 | 8·5 | 10 | 4·0 |
| | 27 | 10 | 34·5 | 12 | 44·1 | | 24 | 7 | 49·6 | 5 | 55·5 |
| | 28 | 15·5 | | 8 | 35·4 | | 25 | 13 | 21·2 | 11 | 42·7 |

Dec. 1888.

Physical Observations of Jupiter.

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| | | I. | II. | | | I. | II. |
|---------|--|-----------|-----------------------------------|----------|--|-----------|-----------|
| | | (877°·90) | (870°·27) | | | (877°·90) | (870°·27) |
| 1889. | | h m | h m | 1889. | | h m | h m |
| Aug. 26 | | 9 2·3 | 7 34·1 | Sept. 24 | | 11 54·0 | 6 37·6 |
| 27 | | 14 34·0 | 13 21·3 | 25 | | 7 35·2 | 12 25·0 |
| 28 | | 10 15·1 | 9 12·8 | 26 | | 3 16·4 | 8 16·6 |
| 29 | | 5 56·2 | 5 4·3 | 27 | | 8 48·3 | 4 8·2 |
| | | 15 46·8 | 15 0·0 | 28 | | 4 29·5 | 9 55·6 |
| 30 | | 11 27·9 | 10 51·5 | 29 | | 10 1·4 | 5 47·2 |
| 31 | | 7 9·1 | 6 43·0 | 30 | | 5 42·6 | 11 34·6 |
| Sept. 1 | | 12 40·8 | 12 30·2 | Oct. 1 | | 11 14·5 | 7 26·2 |
| 2 | | 8 21·9 | 8 21·7 | 2 | | 6 55·7 | 13 13·6 |
| 3 | | 4 3·1 | 4 13·2 | 3 | | 12 27·6 | 9 5·2 |
| | | 13 53·6 | 14 9·0 | 4 | | 8 8·9 | 4 56·8 |
| 4 | | 9 39 | Middle of | 5 | | 3 50·1 | 10 44·2 |
| | | | fourth eclipse of <i>Sat. IV.</i> | 6 | | 9 22·0 | 6 35·9 |
| 4 | | 9 34·8 | 10 0·5 | 7 | | 5 3·3 | 12 23·3 |
| 5 | | 5 15·9 | 5 52·0 | 8 | | 10 35·2 | 8 14·9 |
| | | 15 6·5 | 15 47·7 | 9 | | 6 16·4 | 4 6·5 |
| 6 | | 10 47·7 | 11 39·3 | 10 | | 11 48·3 | 9 54·0 |
| 7 | | 6 28·8 | 7 30·8 | 11 | | 7 29·6 | 5 45·6 |
| 8 | | 12 0·6 | 13 18·1 | 12 | | 3 10·9 | 11 33·1 |
| 9 | | 7 41·7 | 9 9·6 | 13 | | 8 42·8 | 7 24·7 |
| 10 | | 3 22·9 | 5 1·1 | 14 | | 4 24·1 | 3 16·3 |
| | | 13 13·5 | 14 56·9 | 14 | | 14 14·8 | 13 12·2 |
| 11 | | 8 54·7 | 10 48·4 | 15 | | 9 56·0 | 9 3·7 |
| 12 | | 4 35·9 | 6 40·0 | 16 | | 5 37·3 | 4 55·4 |
| 13 | | 10 7·6 | 12 27·3 | 17 | | 11 9·2 | 10 42·8 |
| 14 | | 5 48·8 | 8 18·8 | 18 | | 6 50·5 | 6 34·6 |
| 15 | | 11 20·6 | 14 6·1 | 19 | | 12 22·5 | 12 22·0 |
| 16 | | 7 1·8 | 9 57·7 | 20 | | 8 3·8 | 8 13·7 |
| 17 | | 12 33·6 | 5 49·3 | 21 | | 3 45·0 | 4 5·4 |
| 18 | | 8 14·8 | 11 36·6 | | | 13 35·7 | 14 1·2 |
| 19 | | 3 56·0 | 7 28·2 | 22 | | 9 17·0 | 9 52·8 |
| 20 | | 9 27·9 | 13 15·5 | 23 | | 4 58·3 | 5 44·5 |
| 21 | | 5 9·1 | 9 7·1 | 24 | | 10 30·2 | 11 32·0 |
| 22 | | 10 40·9 | 4 58·7 | 25 | | 6 11·5 | 7 23·6 |
| 23 | | 6 22·1 | 10 46·0 | | | | |

I

In order to reduce the longitudes of system I of the three preceding ephemerides to those adopted in the present ephemeris, the following corrections, duly interpolated, must be applied:

| | | | | | |
|---------------|-------|--------------|--------|--------------|-------|
| 1885, Nov. 14 | +58°0 | 1887, Jan. 8 | +159°2 | 1888, Jan. 3 | +33°2 |
| 1886, Jan. 13 | +28°0 | Mar. 9 | 138°2 | Mar. 3 | +12°2 |
| Mar. 14 | -2°0 | May 8 | 117°2 | May 2 | -8°8 |
| May 13 | -32°0 | July 7 | 96°2 | July 1 | -29°8 |
| July 12 | -62°0 | Sept. 5 | +75°2 | Aug. 30 | -50°8 |

The passages over the middle of the illuminated disc observed by Mr. A. S. Williams, and one, observed 1887, July 16, by Mr. Denning, give the following longitudes of the two equatorial spots according to system I of the present ephemeris:

| G.M.T. | | | | Long. | Long. | G.M.T. | | | | Long. | Long. |
|---------|----|----|------|-------|---------|--------|---------|----|------|-------|-------|
| 1887. | h | m | | ° | | 1888. | h | m | | ° | |
| Mar. 16 | 13 | 34 | W. | ... | 177°6 | May 13 | 14 | 18 | W. | ... | 167°6 |
| | 18 | 14 | 45 | " | 176°9 | | 15 | 11 | 9 | 8°4 | |
| | 23 | 13 | 0 | " | 183°0 | | 19 | 13 | 30·5 | 6°8 | |
| July 16 | 8 | 12 | D. | ... | 169°2 | | 20 | 13 | 50 | ... | 176°7 |
| 1888. | | | | | | | 21 | 14 | 44 | 7°7 | |
| Mar. 1 | 14 | 57 | W. | ... | 177°7 | | 22 | 10 | 22 | 5°9 | |
| | 25 | 14 | 50 | 4°2 | | | 23 | 10 | 32 | ... | 170°1 |
| Apr. 1 | 14 | 9 | | 5°1 | | | 24 | 11 | 30 | 3°5 | |
| | 3 | 15 | 21 | 5°0 | | | 25 | 11 | 37 | ... | 165°8 |
| | 4 | 15 | 31 | ... | 169°1 | | June 1 | 11 | 18 | ... | 180°3 |
| | 6 | 12 | 13 | 4°4 | | | 2 | 12 | 7 | 8°2 | |
| | 8 | 13 | 20 | 1°2 | | | 3 | 12 | 44 | ... | 188°7 |
| | 14 | 11 | 40 | ... | 168°3 | | 10 | 11 | 59·5 | ... | 187°5 |
| | 20 | 15 | 26 | ... | 174°2 | | 14 | 9 | 27 | 6°4 | |
| | 26 | 14 | 19 | 1°6 | | | 16 | 10 | 29 | 0°1 | |
| | 29 | 15 | 55 ± | ... | 174°2 ± | | 17 | 11 | 8 | ... | 181°9 |
| May 1 | 12 | 26 | | 2°8 | | | 22 | 9 | 15 | ... | 182°7 |
| | 3 | 13 | 44·5 | 6°8 | | | 30 | 9 | 10 | 3°0 | |
| | 5 | 14 | 55 | 5°8 | | | July 1 | 9 | 49·5 | ... | 185°0 |
| | 10 | 13 | 1°5 | 6°8 | | | 18 | 10 | 12 | 2°5 | |
| | 11 | 13 | 9 | ... | 169°4 | | 19 | 10 | 46 | ... | 181°1 |
| | 12 | 14 | 13 | 6°5 | | | Aug. 25 | 8 | 19·5 | ... | 169°6 |
| | 13 | 9 | 52 | 5°4 | | | | | | | |

Note on the Values of the Constants for the new Dearborn Observatory.
By Lieutenant-General Tennant.

Since the proofs were passed I have received a communication as to the place of this Observatory from Professor Hough, the director, giving the following results :

| Longitude from Greenwich. | | | | Corr. to | Lat. | tan ϕ' . | log A. | log D. | log P. |
|---------------------------|---------------|----|-----------|----------|------|---------------|--------|--------|---------------|
| Time. | Parts of day. | | | S.T.M.N. | | | | | |
| h | m | s | d | s | ° | ' | | | |
| -5 | 50 | 42 | -0°243542 | +57'61 | +42 | 03 | 9.9522 | 9.6388 | 0.7671 0.9428 |

Errata in Professor Holden's Observations of Nebulæ, Monthly Notices,
Vol. XLVIII. No. 9.

Figure at bottom of p. 386—Insert B in the middle of the triangle which has *d, c* and 14 for vertices.

Page 390, line 4 from top, *dele* "blue."
